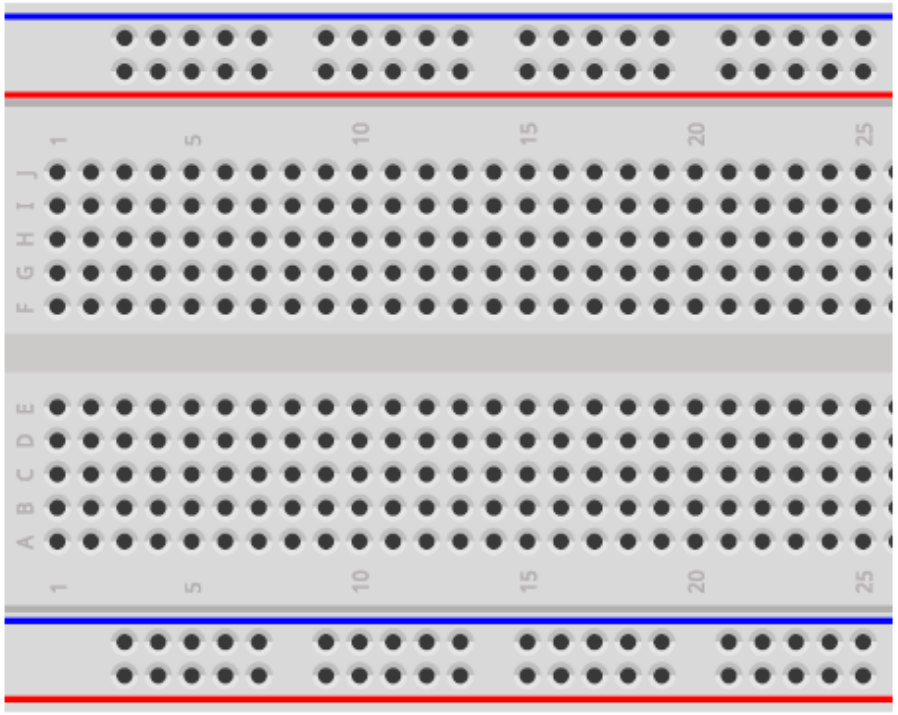
# Circuits Lab
# Equipment and Overview

Mark Redekopp

# Solderless BreadBoard/Protoboard



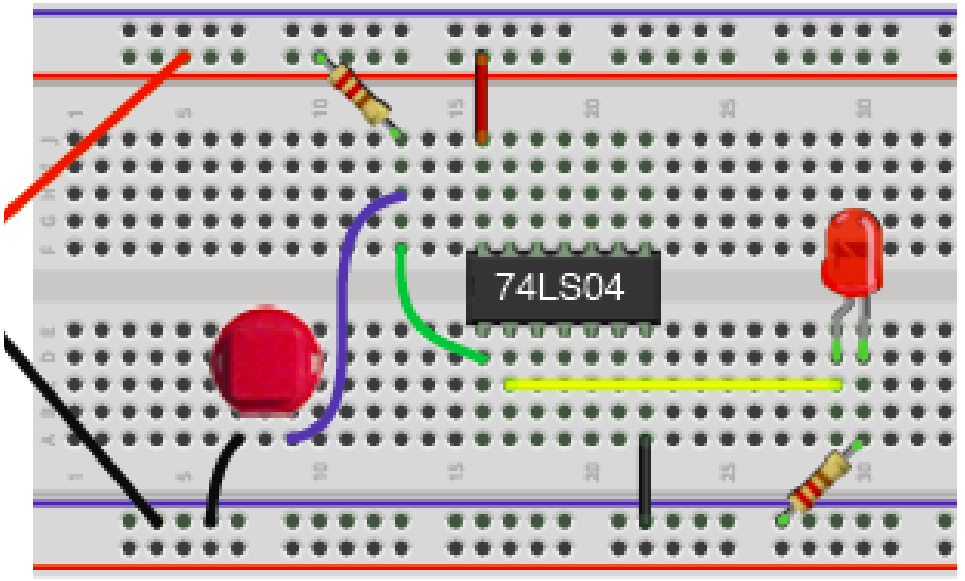
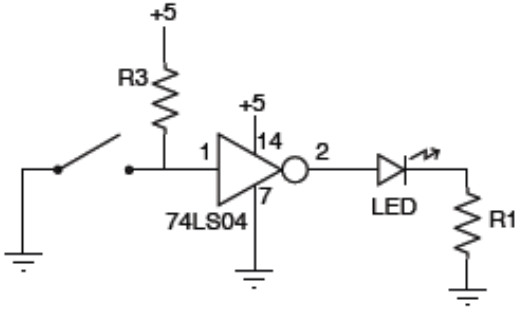
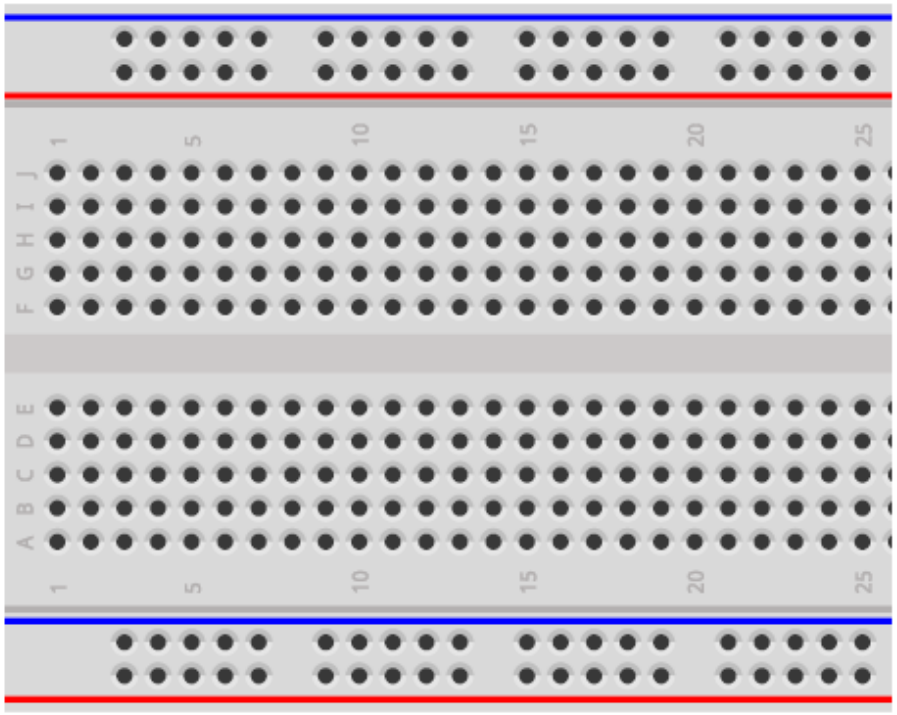



Figure 1: Portion of a breadboard

# Solderless BreadBoard/Protoboard



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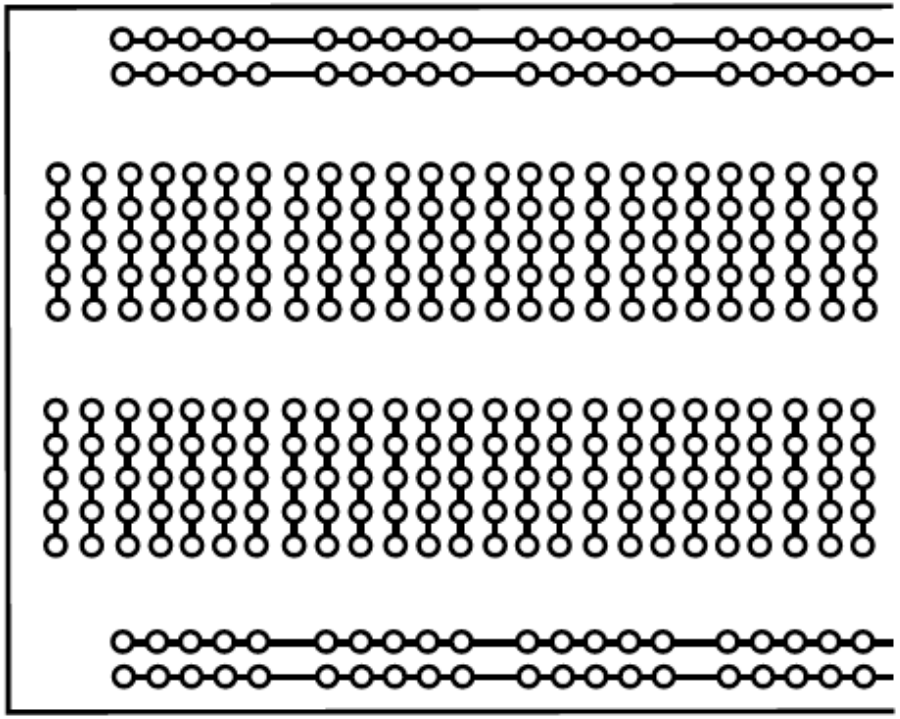
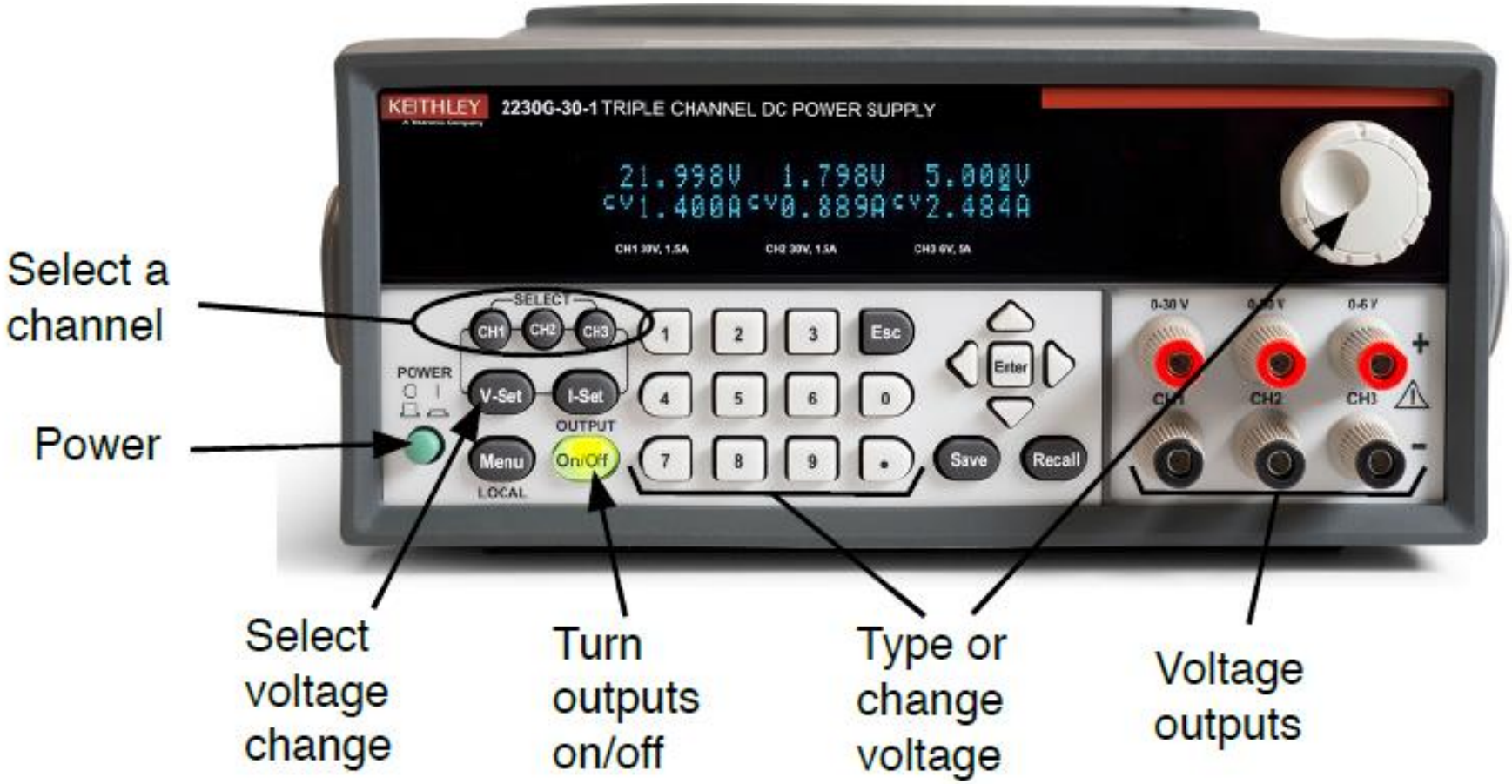


Figure 2: Breadboard holes connection pattern

# Power Supply



# Digital Multimeter

## (Measure Voltage, Current, Resistance)


Figure 7: Multimeter

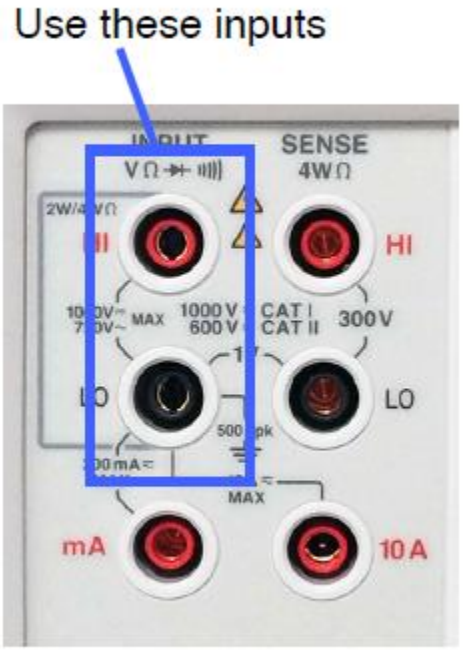
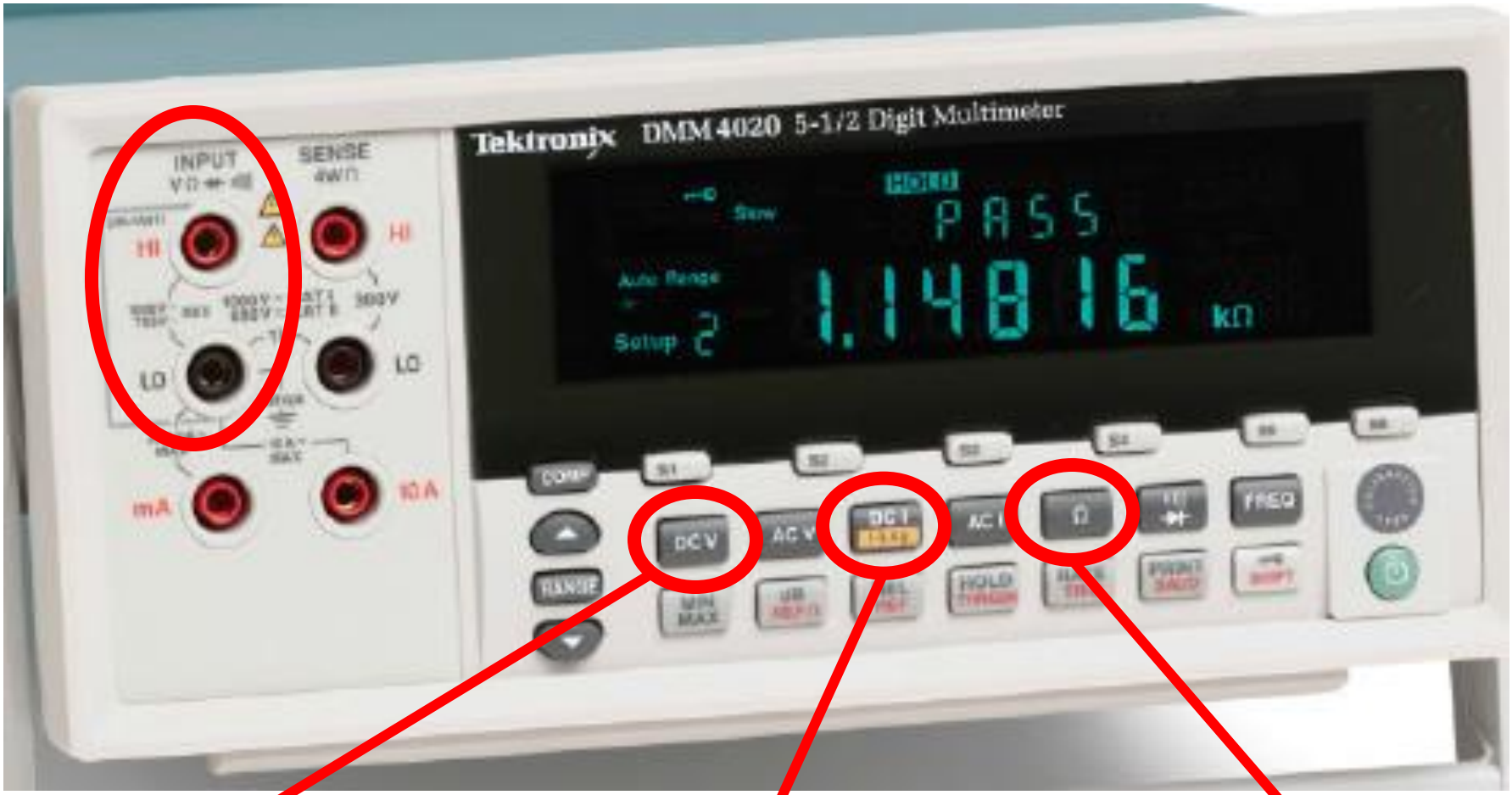



Figure 8: DMM Inputs

# Digital Multimeter

## (Measure Voltage, Current, Resistance)




Choose DC V
To measure Voltage

Choose DC I
To measure current

Choose Ω
To measure resistance

# Test Leads & Connections

Figure 4: Banana plugs

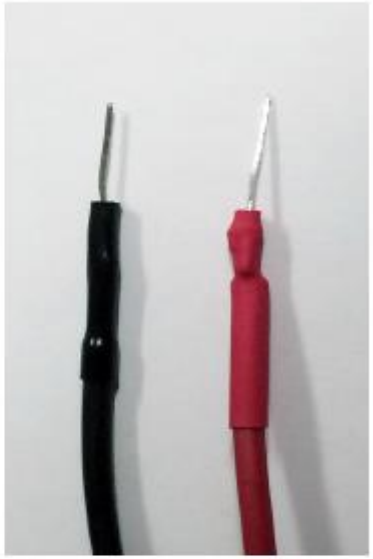


Figure 5: Test leads with pins on ends

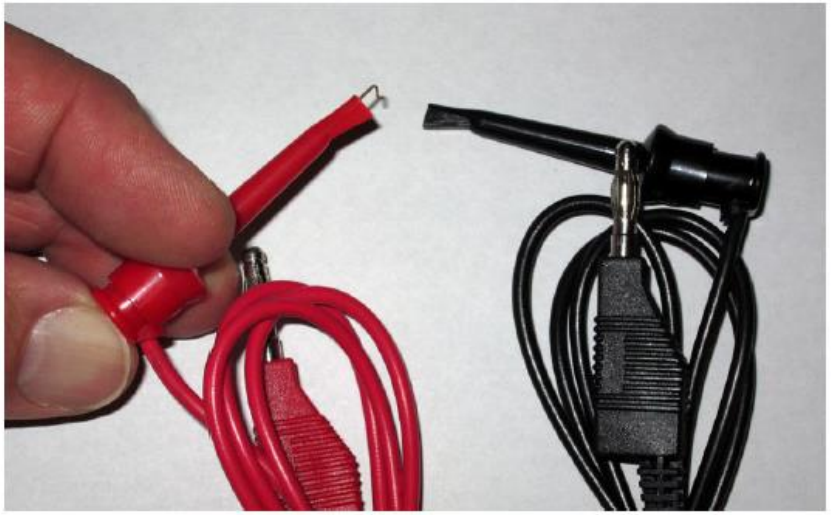
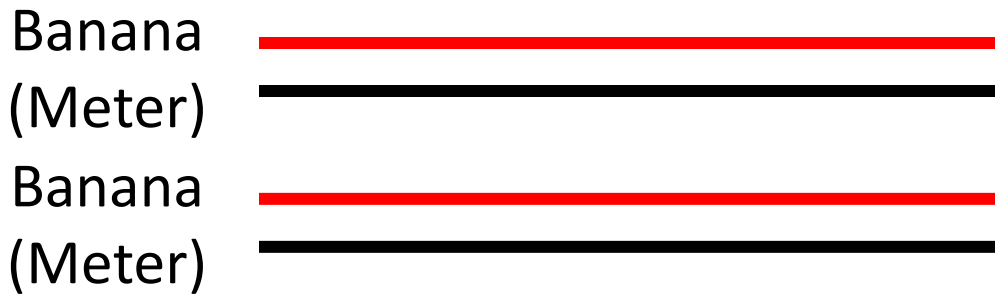
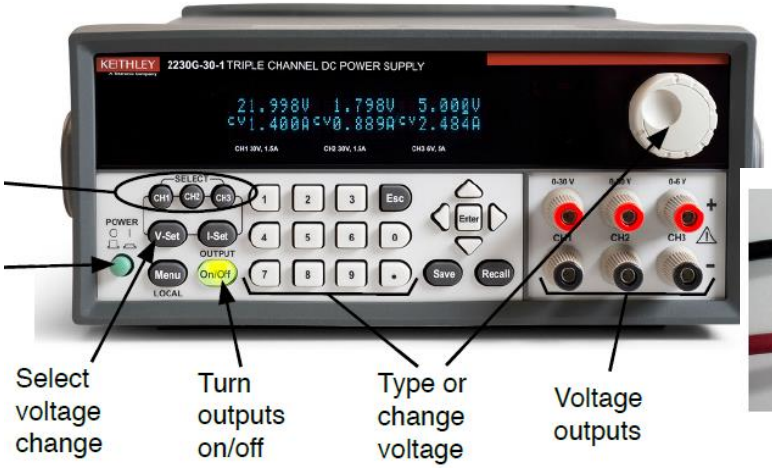


Figure 11: Test clips have a hook at the end that is exposed by pressing on the back of the clip



# Test Leads & Connections



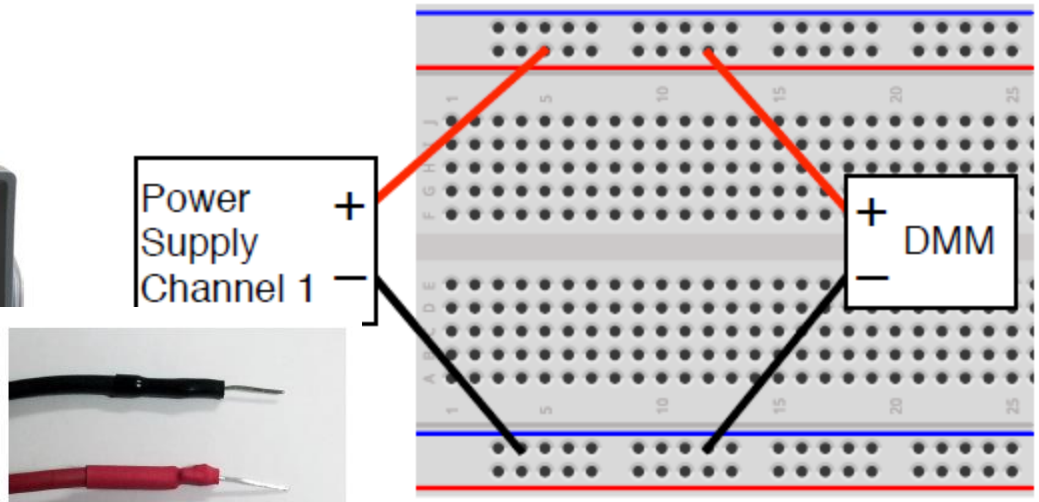




Figure 6: Connecting power supply and DMM to breadboard


Figure 7: Multimeter

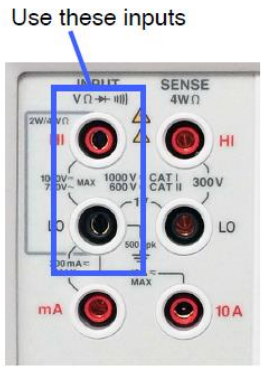



Figure 8: DMM Inputs

# Resistors & Their Measurement

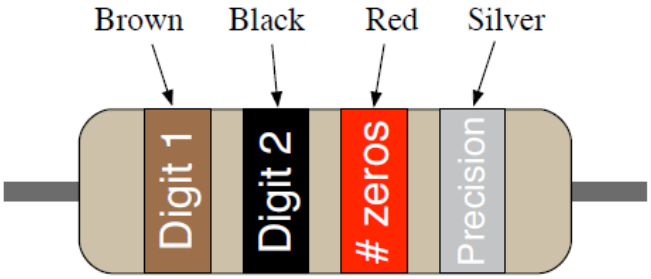



Figure 9: Resistor with color bands. Colors shown are for a 1000Ω, 10% resistor

| | | |
|---|---|---|
| | Black | 0 |
| | Brown | 1 |
| | Red | 2 |
| | Orange | 3 |
| | Yellow | 4 |
| | Green | 5 |
| | Blue | 6 |
| | Violet | 7 |
| | Gray | 8 |
| | White | 9 |

Figure 10: Resistor color code

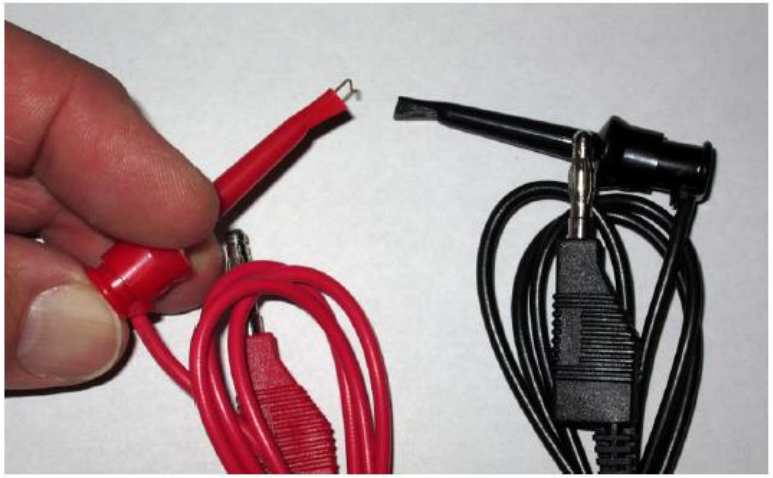


Figure 11: Test clips have a hook at the end that is exposed by pressing on the back of the clip

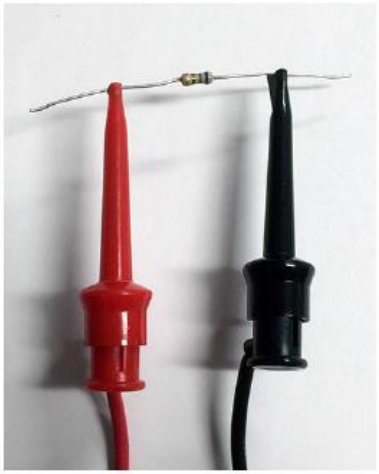


Figure 12: Attach test clips to resistor leads

# Voltage Divider Circuit

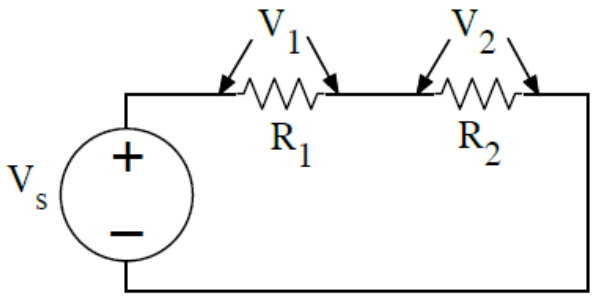



Figure 15: Circuit with resistors in series

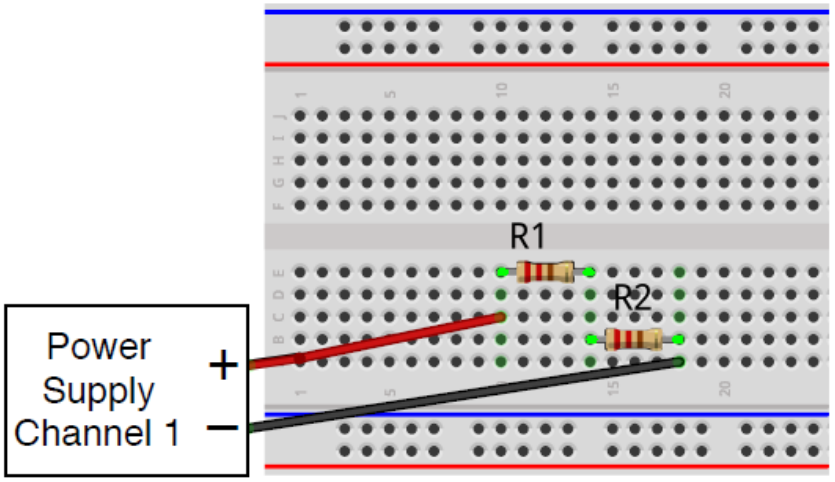
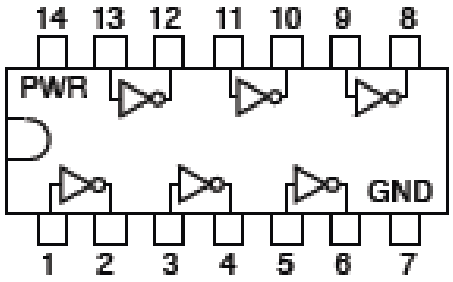
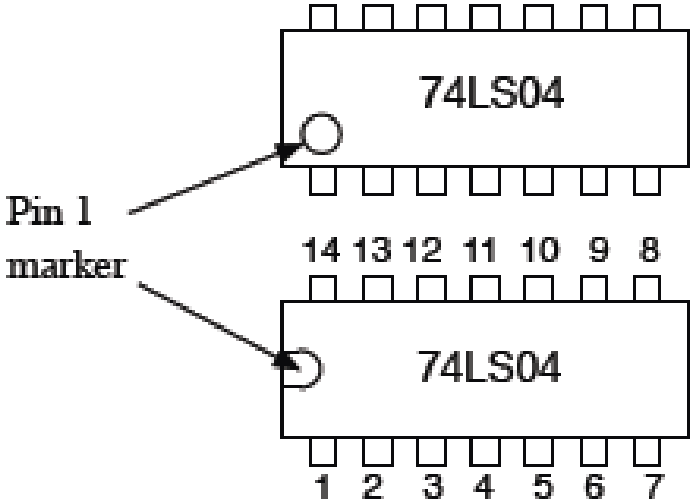
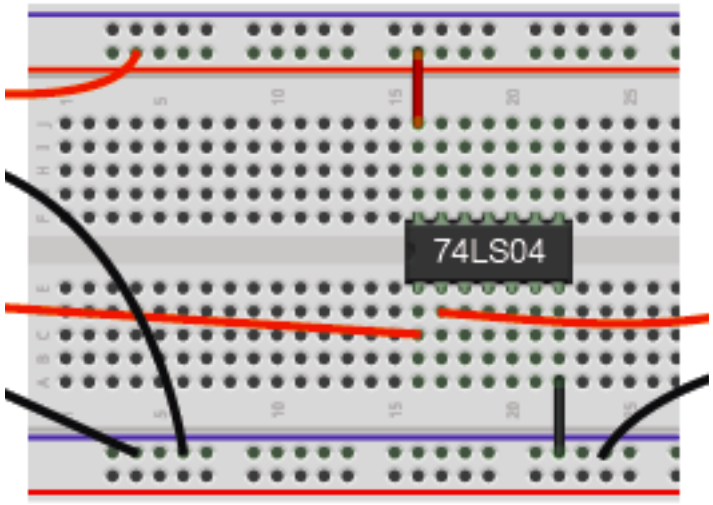



Figure 16: Series resistors on a breadboard

# Understanding Chip Connections



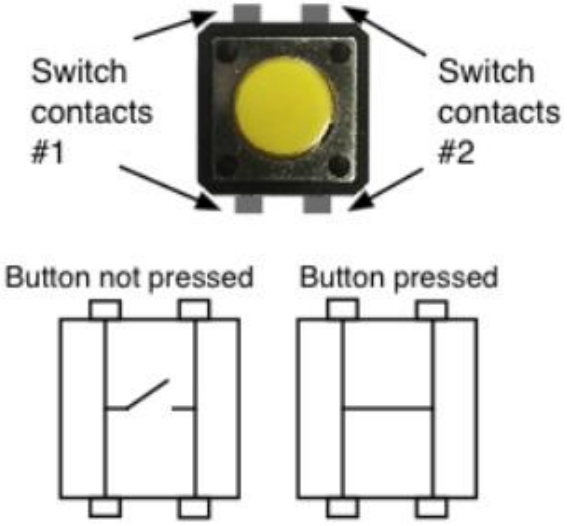



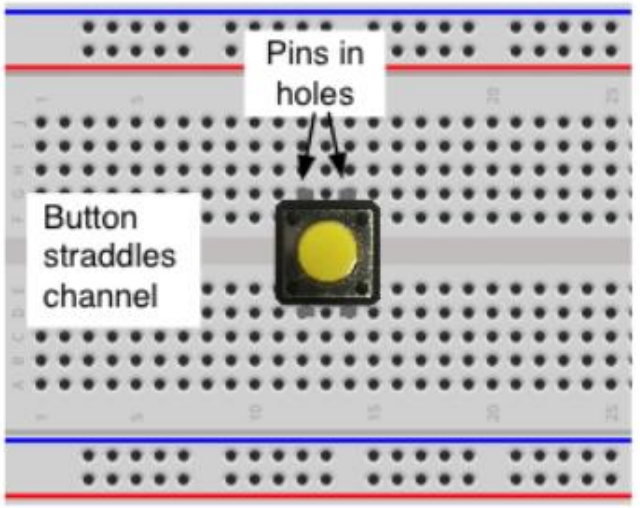
# PROCEDURAL NOTES

# Buttons

Pushbuttons

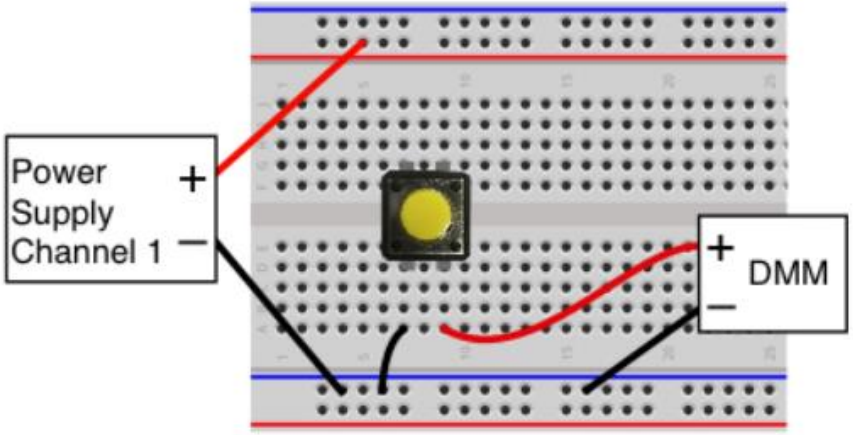



Schematic of buttons

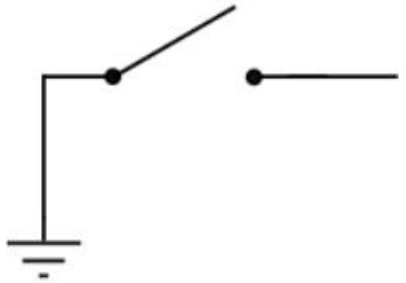



Buttons installed on breadboard

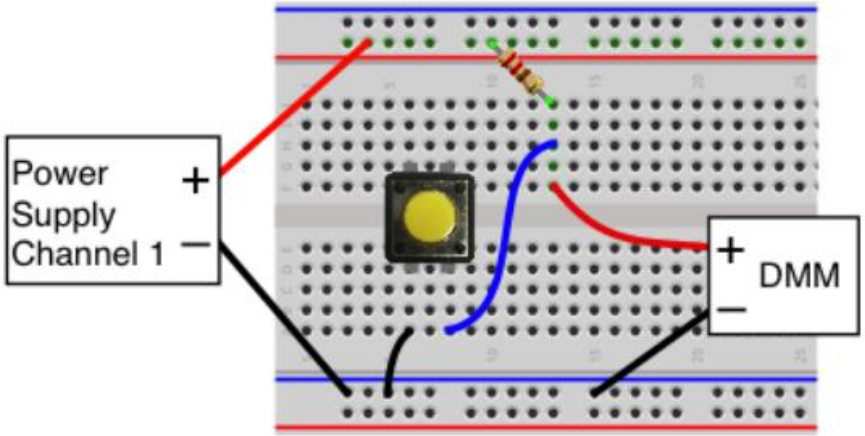
# Switch Configurations



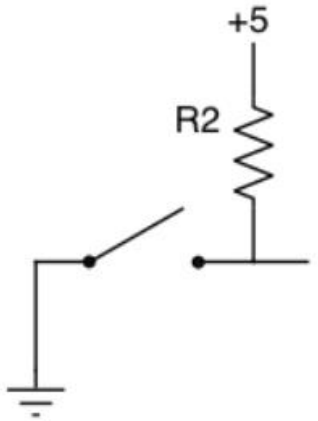

Button with one contact grounded



Schematic of circuit

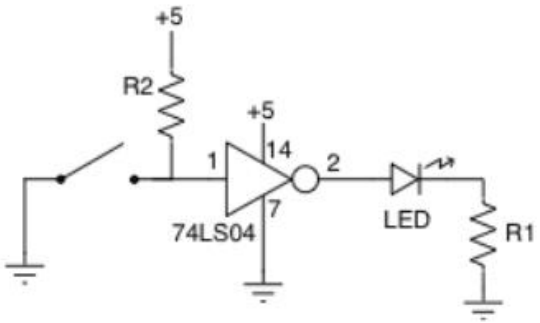



Button with resistor to +5 volts

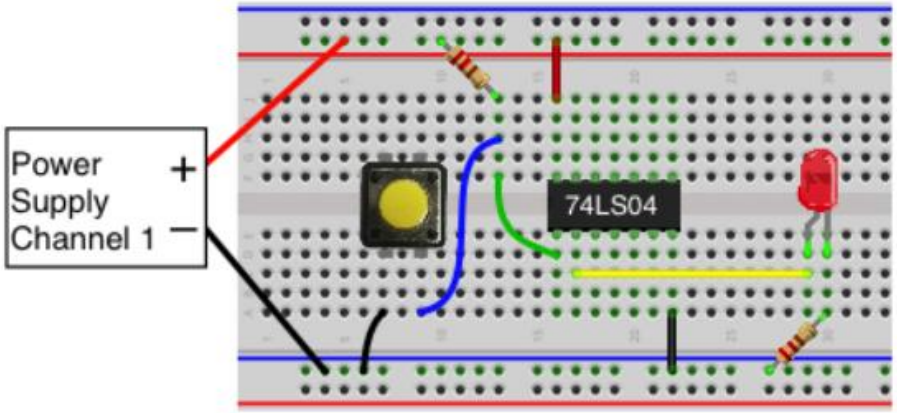



Schematic of circuit

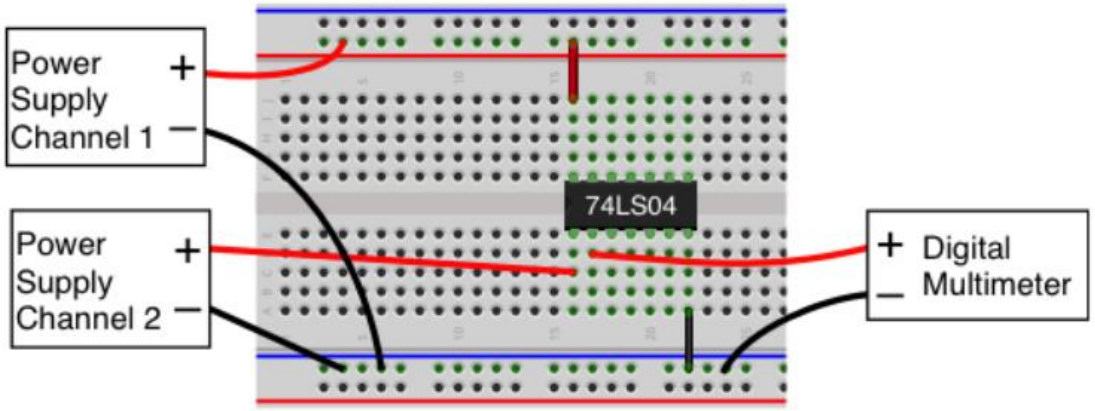
# Digital Circuits




Button, 74LS04 and LED circuit




Button, 74LS04 and LED on a breadboard




Measuring threshold with DMM

# WHEN YOU ARRIVE

# When You Arrive…

- We will issue toolkits in plastic boxes
  - These are yours to keep for the semester and then return everything but the Arduino at the end of the semester
  - Put a paper with your name on it somewhere in the box
  - You may take these home so you can work anywhere
- Parts available at the front table in VHE 205
- May work in teams of 2 and a few groups of 3
  - Ensure each member rotates building and using the equipment
  - Each person should submit their own answers